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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/804,279	03/18/2004	Wei-Cheng Wilson Lin	12227-070001	7449
20985	7590	06/13/2005	EXAMINER	
FISH & RICHARDSON, PC 12390 EL CAMINO REAL SAN DIEGO, CA 92130-2081			BLEVINS, JERRY M	
			ART UNIT	PAPER NUMBER
			2883	

DATE MAILED: 06/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/804,279

Applicant(s)

WILSON LIN ET AL.

Examiner

Jerry Martin Blevins

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-19 and 21-24 is/are rejected.
- 7) ☒ Claim(s) 20 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 01/10/2005
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____

DETAILED ACTION

Claim Objections

Claims 9-11 are objected to because of the following informalities: the claimed sensing unit has no antecedent basis in the base claim 1. For examination purposes, examiner interprets these claims as if dependent on claim 8.

Claim 18 is objected to because of the following informalities: the claimed fiber has no antecedent basis in the base claim 12. For examination purposes, examiner interprets the claimed fiber as referring to the waveguide of claim 12.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3, 6, and 7 are rejected under 35 U.S.C. 102(e) as being anticipated by US Pre Grant Publication of Cai et al, number 2002/0094168.

Regarding claim 1, Cai teaches a device (Figure 1, element 100) comprising a fiber (elements 110,120) having a side surface formed on fiber cladding where an evanescent field of guided light in the fiber exists (paragraph 8, page 1 and paragraph

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16, page 2) and a whispering gallery mode cavity (element 101 and paragraph 8, page 1) formed on the side surface to support one or more whispering gallery modes and configured to evanescently extract energy in light guided in the fiber into a whispering gallery mode.

Regarding claim 2, Cai teaches the limitations of the base claim 1. The whispering gallery mode cavity of Cai explicitly includes a cavity layer and inherently includes a bottom and a top cladding layer. The cladding layers are necessarily present to prevent leakage of light. The cavity layer necessarily has an index of refraction greater than that of either cladding layer in order to prevent leakage of light.

Regarding claim 3, Cai teaches the limitations of the base claim 1. Cai also teaches that the whispering gallery mode cavity is a ring (paragraph 22, page 3), which is parallel to the side surface of the fiber (Figure 1).

Regarding claim 6, Cai teaches the limitations of the base claim 1. Cai also teaches a dump waveguide coupled to the whispering gallery mode cavity to evanescently couple light in the whispering gallery mode out of the whispering gallery mode cavity (paragraphs 8 and 9, page 1).

Regarding claim 7, Cai teaches the limitations of the base claim 1. Cai also teaches that the whispering gallery mode cavity is located off a center of a fiber core (section of fibers 110,120 indicated by arrows) of the fiber (paragraph 16, page 2).

Claims 12-18 are rejected under 35 U.S.C. 102(e) as being anticipated by US Patent to Tapalian et al, number 6657731.

Regarding claim 12, Tapalian teaches a device (Figure 1B) comprising an optical waveguide (element 110) having a side surface where an evanescent field of guided light in the waveguide is present (column 2, lines 32-41) and a whispering gallery mode cavity (102) formed on the side surface to support one or more whispering gallery modes and configured to evanescently extract energy in light guided in the waveguide into a whispering gallery mode (column 2, lines 32-41).

Regarding claim 13, Tapalian teaches the limitations of the base claim 12. Tapalian also teaches a second whispering gallery mode cavity formed on the side surface to evanescently couple to the waveguide (Figure 5 and column 7, lines 17-23).

Regarding claim 14, Tapalian teaches the limitations of the base claim 13. Tapalian also teaches that the second whispering gallery mode cavity is spatially close to the whispering gallery mode cavity to allow for evanescent coupling with the whispering gallery mode cavity. (Figure 5 shows two cavities, on the same side of a division, which are in close proximity so as to be optically coupled.)

Regarding claim 15, Tapalian teaches the limitations of the base claim 14. Tapalian also teaches third and fourth whispering gallery mode cavities both coupled to the side surface to evanescently couple to the waveguide, wherein the third and fourth whispering gallery mode cavities are close to each other to be optically coupled to each other via evanescent coupling. (Figure 5 shows two other cavities, on the other side of the division, which are in close proximity so as to be optically coupled.)

Regarding claim 16, Tapalian teaches the limitations of the base claim 15. Tapalian also teaches that the first and second whispering gallery mode cavities are

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spaced from the third and fourth whispering gallery mode cavities so that the first and second whispering gallery mode cavities do not directly optically couple with the third and fourth whispering gallery mode cavities. (Figure 5 shows the two sets of cavities are separated by a division so that they are not directly optically coupled.)

Regarding claim 17, Tapalian teaches the limitations of the base claim 13.

Tapalian also teaches that a second whispering gallery mode cavity is spaced from the first whispering gallery mode cavity and is not in direct optical coupling with the first whispering gallery mode cavity (Figure, two cavities separated by the division), and wherein the second whispering gallery mode cavity has a resonance wavelength different from a resonance wavelength in the first whispering gallery mode cavity (column 7, lines 23-25).

Regarding claim 18, Tapalian teaches the limitations of the base claim 12.

Tapalian also teaches a sensing unit coupled to the waveguide to receive light guided in the waveguide and to measure a change in optical coupling between the whispering gallery mode cavity and the waveguide caused by an environmental change (column 7, lines 26-35).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4, 5, 8, 11, 21, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cai in view of Tapalian.

Regarding claim 4, Cai teaches the limitations of the base claim 1. Cai also teaches that the cavity is parallel to the side surface of the fiber (Figure 1). Cai does not teach that the whispering gallery mode cavity is a disk. Tapalian teaches a whispering gallery mode cavity that is a disk (column 3, lines 45-47). It would have been obvious to one of ordinary skill in the art at the time of the invention to include the disk cavity of Tapalian in the device of Cai. The motivation would have been to construct a more universally applicable device.

Regarding claim 5, Cai teaches the limitations of the base claim 1. Cai does not teach a second whispering gallery mode cavity. Tapalian teaches two whispering gallery mode cavities spatially close to one another to allow for evanescent coupling. (Figure 5 shows two cavities, on the same side of a division, which are in close proximity so as to be optically coupled.) It would have been obvious to one of ordinary skill in the art at the time of the invention to include the second whispering gallery mode cavity, as taught by Tapalian, into the design of the device of Cai. The motivation would have been to couple light of different resonant frequencies (Tapalian, column 7, lines 23-25).

Regarding claim 8, Cai teaches the limitations of the base claim 1, but does not teach a sensing unit. Tapalian teaches a sensing unit coupled to a waveguide to receive light guided in the waveguide and to measure a change in optical coupling between a whispering gallery mode cavity and the waveguide caused by an environmental change (column 7, lines 26-35). It would have been obvious to one of ordinary skill in the art to incorporate the sensing unit of Tapalian in to the device of Cai. The motivation would have been give the device industrial and military applicability (Tapalian, column 7 lines 32-36).

Regarding claim 11, Cai in view of Tapalian teaches the limitations of the examiner interpreted base claim 8. Tapalian also teaches that the sensing unit comprises a processing unit to process the measured change to extract information on a refractive index of an external medium surrounding the whispering gallery mode cavity (column 2, lines 51-54). The above justification for obviousness holds.

Regarding claim 21, Cai teaches a method of providing a fiber (elements 110,120) having a side surface formed on fiber cladding where an evanescent field of guided light in the fiber exists (paragraph 8, page 1 and paragraph 16, page 2) and at least one whispering gallery mode cavity (element 101 and paragraph 8, page 1) that is in evanescent coupling with the fiber through the side surface. Cai does not teach the provision of a sensor in the fiber. Cai also does not teach the steps of exposing the sensor to an external medium to cause a change in the at least one whispering gallery mode cavity, monitoring the change in guided light caused by the at least one whispering gallery mode cavity, and extracting information about the external medium

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based on the change. Tapalian teaches the provision of a sensor (column 7, line 21). Tapalian also teaches the steps of exposing the sensor to an external medium to cause a change in the at least one whispering gallery mode cavity (column 2, lines 42-54), monitoring the change in guided light caused by the at least one whispering gallery mode cavity (column 2, lines 51-54), and extracting information about the external medium based on the change (column 2, lines 51-54). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the sensor and the further limiting steps, as taught by Tapalian, into the method of Cai. The motivation would have been to give the method greater industrial and military applicability (Tapalian, column 7 lines 32-36).

Regarding claim 24, Cai in view of Tapalian teaches the limitations of the base claim 21. Tapalian also teaches that the information about the external medium includes a presence of a selected material ((column 2, line 54). The above justification for obviousness holds.

Claims 9, 10, 22, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cai in view of Tapalian as applied to claims 4, 5, 8, 11, 21, and 24 above, and further in view of US Pre Grant Publication of Anderson et al, number 2004/0223697.

Regarding claim 9, Cai in view of Tapalian teaches the limitations of the examiner interpreted base claim 8. Cai in view of Tapalian does not teach that the sensing unit comprises a processing unit to process the measured change to extract information on a temperature. Anderson teaches a whispering gallery mode cavity

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(112) couple to a waveguide 110. Anderson also teaches a sensing unit coupled to the waveguide to measure a change in optical coupling between the waveguide and cavity and to extract information on a temperature (page 4, paragraph 48). It would have been obvious to one of ordinary skill in the art to include the extraction of temperature information, as taught by Anderson, into the device of Cai in view of Anderson. The motivation would have been to expand the industrial applicability of the device.

Regarding claim 10, Cai in view of Tapalian teaches the limitations of the examiner interpreted base claim 8. Cai in view of Tapalian does not teach that the sensing unit comprises a processing unit to process the measured change to extract information on a pressure. Anderson teaches a whispering gallery mode cavity (112) couple to a waveguide 110. Anderson also teaches a sensing unit coupled to the waveguide to measure a change in optical coupling between the waveguide and cavity and to extract information on a temperature (page 4, paragraph 48). It would have been obvious to one of ordinary skill in the art to include the extraction of pressure information, as taught by Anderson, into the device of Cai in view of Anderson. The motivation would have been to expand the industrial applicability of the device.

Regarding claim 22, Cai in view of Tapalian teaches the limitations of the base claim 21. Cai in view of Tapalian does not teach that the information about the external medium includes a temperature in the external medium. Anderson teaches a whispering gallery mode cavity (112) couple to a waveguide 110. Anderson also teaches a sensing unit coupled to the waveguide to measure a change in optical coupling between the waveguide and cavity and to extract information on a temperature

(page 4, paragraph 48). It would have been obvious to one of ordinary skill in the art to include the temperature information of Anderson into the method of Cai in view of Anderson. The motivation would have been to expand the industrial applicability of the method.

Regarding claim 23, Cai in view of Tapalian teaches the limitations of the base claim 21. Cai in view of Tapalian does not teach that the information about the external medium includes a pressure in the external medium. Anderson teaches a whispering gallery mode cavity (112) couple to a waveguide 110. Anderson also teaches a sensing unit coupled to the waveguide to measure a change in optical coupling between the waveguide and cavity and to extract information on a pressure (page 4, paragraph 48). It would have been obvious to one of ordinary skill in the art to include the pressure information of Anderson into the method of Cai in view of Anderson. The motivation would have been to expand the industrial applicability of the method.

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tapalian in view of US Patent of Dyott, number 6,718,097.

Tapalian teaches a pair of whispering gallery mode cavities optically coupled to each other and optically coupled to a waveguide. (Figure 5 shows two cavities, on the same side of a division, which are in close proximity so as to be optically coupled.) Tapalian also teaches a sensing unit to measure a parameter in reflected light from the pair of cavities to measure an environmental effect affecting the optical coupling of the pair of cavities. Tapalian does not teach a fiber having a portion of the cladding and a portion of the underlying core removed to form a flat surface. Dyott teaches a fiber

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having a portion of cladding and a portion of the underlying core removed to form a flat surface (column 3, lines 29-52 and Figure 2).

Allowable Subject Matter

Claim 20 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Tapalian in view of Dyott teaches the limitations of the base claim 19. Tapalian in view of Dyott does not teach a housing comprising a chamber and a moveable diaphragm. Tapalian in view of Dyott, either alone or in combination with the other prior art of record, does not disclose or render obvious the limitations of a housing comprising a chamber and a moveable diaphragm.

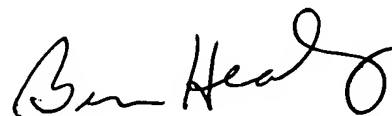
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jerry Martin Blevins whose telephone number is 571-272-8581. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank G. Font can be reached on 571-272-2415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JMB


Brian Healy
Primary Examiner